The synopsis of the proposed research work entitled

Gamma ray interaction studies of CdS thin films doped high Z elements in the range of 0.123 Mev to 1.33 Mev.

Submitted to

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To be submitted by

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For the registration of the degree
Doctor of Philosophy

In Physics

(Faculty of Science and Technology)

Under the guidance of

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Format for submission of Ph.D. Synopsis / Work plan For faculty of Science to be submitted in front of RRC

Title: G**amma ray interaction studies of CdS thin films doped high Z elements in the range of 0.123 Mev to 1.33 Mev.**

Abstract of proposed work plan/ problem:

It is proposed to study the thin films for protecting the human beings from radiations from thin films with high Z elements. Thin films doped with high Z elements and the effect of their doping concentrations on gamma ray absorption properties will be observed. We planned to synthesis of CdS thin films doped with different elements Lead (Pb), Lanthanum (La) etc. using the spray pyrolysis technique. In the present study, the mass attenuation coefficient (μ/ρ) of thin films by varying concentration with Lead and Lanthanum will be determined for different gamma ray energies and be characterizedby using different characterization technique and further Total atomic cross section, electronic cross section, half thickness values will be measured. It is also planned to fabricate the radiation protecting cloths. The comparative study of before and after the gamma radiation of thin film will be studied.

1. Introduction

Many interactions can occur when gamma rays penetrates matter some of the should be isolated and others considered separately and the cross section that result depends on the energy of the gamma rays, atomic charge of matter and geometry of the experiment. The range of our study approximatively 0.1 mev to 1.33 mev affects the range of interactions called photoelectric effect Compton Effect and pair production and other effects below 1% (reyleigh, thomans, delberg, nuclear resonance, raman and nuclear photoeffect) also dominancy depend on low high Z regions and our present work will restrict the geometry as the good geometry which involved photon traversing from absorber. Our aim is to study the thin films and their interaction with gamma ray and the change in other characteristic of it

2. Review of Literature and Development in the subject (Previous work done in the relevant area):

Bhadoria, B. S., Yadav, R. S., &Srivastava, A. (2011) reported the thin films of CdS deposited on glass substrate by chemical bath deposition techniques. The results from X-ray diffraction and optical absorption coefficient are used to characterize the thin film. Study represent that the growth of CdS-CBD thin film is controlled by pH, temperature, time of dipping and concentration of material.

Linear attenuation coefficient for gamma rays for different materials and solutions plays an important role radiation dosimetry. There are different measurement techniques to measure them. As technology is developed day by day, the gamma rays are used in many fields, like medicine, food preservation, Radiation Shielding and with their measurement techniques are developed but we find these measurements can be made with still simpler method. Teli et al Dongarge S.M. et al has developed the mixture rule and we have used the rule with simpler approach and are considered for our research work. This method is developed from single element mass attenuation coefficient of gamma rays to mixtures (solute and solvent). Dongarge S.M.(2010-15) extended for the mixture of liquid and solid materials also. There are various reports on the measurement of these quantities particularly changes in gamma ray attenuation behaviour of sol-gel derived CIGS thin films which is irradiated by Co-60 isotopes. There they find rise of linear attenuation coefficient indicated with the rise of film density. Hence we have decided to study the materials like thin films (1-6). Hubbell (3) has developed the rule for calculation of gamma absorption coefficient for mixtures and gave tables of theoretical values for various elements and their mixtures. Teli et al (1994) have measured the attenuation coefficient of 123 KeV gamma radiations by dilute solution of sodium chloride. Dongarge et al (2010) reported the linear attenuation coefficient for measurement of linear attenuation coefficients of gamma rays for ammonium sulfate salt by aqueous solution method 0.511 MeV gamma energy. So for the study of both types of absorption coefficient for gamma rays has been done for materials in solid and crystal forms by using various techniques as reported above and the observations are compared with the theoretical values as calculated from Hubbell's mixture rule and his table. Recently S M Dongarge et al measured the attenuation of 0.84 MeV gamma radiations in water soluble compound Ammonium Sulfate by varying concentrations.

3. Objectives of Research/ Proposed Hypothesis:

1. To grow CdS thin films doped with different elements like Lead (Pb), Lanthanum Ln like high z elements etc. using the spray pyrolysis technique.
2. The thin films grown by above methodfor will be used to measure linear and mass attenuation coefficient.
3. To report the innovative findings beneficial for human beings.

4. Methodology to be adopted:

The CdS thin films will be deposited on bare fabric material by spray pyrolysis technique. The necessary deposition parameters will be optimized in initial phase to yield good adherent,stochiometric thin films. The contents of CdS thin films will be varied by using different doping elements like Lead (Pb), Lanthanum (La)etcand their compositions. First the gamma rays are passed through empty holder reaching the detector. The spectrum is obtained for 1800 sec. using MCA which gives plot of channel number Vs counts. We select the interested peak which is smoothed for avoiding the random nature and obtain the peak gross area Ao (The sum of the spread counts which are coming under the peak) this is obtained because in MCA the counts get spread over some energy range around the photo peak. This increases the accuracy of measured thin film kept in the holder and gamma rays are passed through it. The concentration varied by doping Pb and Mn. The gamma rays are passed through such thin films and interested peak gross area measured as A 1 , A 2 , …… A 10 the other quantities measured in the experiment are thickness of the thin films. This procedure is repeated for all the concentrations and all thin films we prepared for gamma energies from 0.123 MeV to 1.33MeV.

5. Importance of study/ Society application:

Thin films occupy a prominent place in basic research and solid state technology. The use of thin film semiconductors has attracted much interest in an expanding variety of

applications in various electronic and optoelectronic devices due to their low production costs also in radiation shielding .

Cadmium sulphide (CdS) is one of the most promising II–VI compound materials because of its wide range of application in various optoelectronic (1-3), piezo-electronic (5-6) and semiconducting devices. The thin films of CdS are of considerable interest for their efficient use in the fabrication of solar cells. In recent years nanocrystalline thin films of different II–VI compound semiconductors have been widely synthesized and studied new applications in radiation shielding and dosimetry.

Nanocrystalline thin films are also polycrystalline in nature but with sizes of crystallites of the order of a few nanometers. A major research goal of recent years is to understand the size dependent properties of nanocrystalline materials and as a result considerable amount of work on synthesis and characterization of nanocrystalline thin films are being carried out .

1. Linear attenuation coefficient for gamma rays for different materials and solutions plays an important role radiation dosimetry.
2. In food preservation like Potato, Onion, food grains.
3. In the treatment of cancer patients e.g. Cobalt therephy.
4. In nuclear power plants. etc

6. Proposed work Plan/ Formulation and Structure of Study:

It is proposed to synthesis of CdS thin films doped with different high Z elements like Lead (Pb), Lanthanum La, etc. using the spray pyrolysis technique. We planned to characterize synthesized thin films by gamma ray attenuation.

Year-wise Plan of work and targets to be achieved

Sr. No.	Academic Year	Year wise Plan
1	2019– 20	• Data Collection. • Study of related literature. • Submitting FIRST six-monthly report. • First phase of practical work. • Submitting SECOND six-monthly report. • Attending Conferences on related work.
	2020– 21	• Second phase of practical work. • Submitting THIRD six-monthly report. • Statistical analysis of data • Publication of Papers in Physics Journals. • Submitting FOURTH six-monthly report. • Attending Conferences on related work. • Attending Conferences on related work. • Publications of research papers in Journals. • Attending Conferences of related work. • Submission synopsis to SRTMU, Nanded. • Submission of thesis

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Research Guide

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